

Precision Remote Sensor for Oxygen and Carbon Dioxide, Phase I

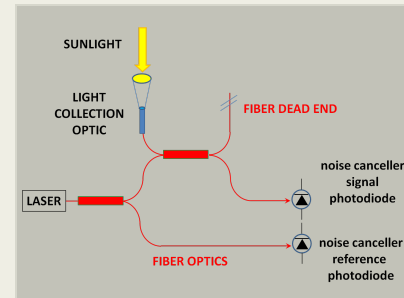
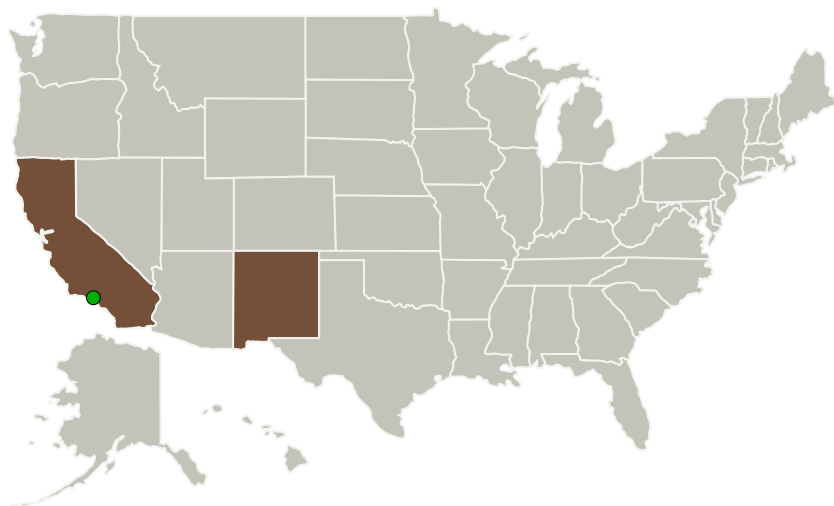
Completed Technology Project (2013 - 2013)



Project Introduction

Mesa Photonics proposes development of a passive optical sensor for simultaneous high-precision measurement of oxygen and carbon dioxide profiles within the full atmospheric column. The approach, which is based on near-infrared heterodyne spectroscopy using solar occultation (i.e., direct solar viewing), is called Precision Heterodyne Oxygen-Calibrated Spectrometer, or PHOCS. Oxygen measurements will provide dry gas corrections and – more importantly – will determine accurate temperature profiles that, in turn, improve the precision of the carbon dioxide column retrievals to better than 1%. Planned instruments will complement results anticipated from the Orbiting Carbon Observatory (OCO-2), Active Sensing of CO₂ Emissions over Nights, Days, and Seasons (ASCENDS), and ground-based Fourier transform spectrometers. PHOCS instruments will be small (not much bigger than a pair of binoculars), light weight, and low power. In keeping with one of the goals of this SBIR topic, planned instruments will be initially configured for operation on the ground, and have size, weight, and power (SWAP) characteristics suitable for easy ground mobility and well as airborne or space-borne deployment. The Phase I project will test an all-fiber-optic heterodyne receiver that will simplify optical design and ensure long-term optical alignment. Oxygen measurements will use the near-infrared band the 1.27 micron wavelength region instead of the more commonly used band at 0.76 microns. The longer wavelength band is weaker; precise lineshapes of many individual rotational lines will be measureable without complications due to highly saturated absorbances or instrument line shape functions (ILS). Carbon dioxide measurements will use the well-characterized band at 1.57 microns.

Primary U.S. Work Locations and Key Partners

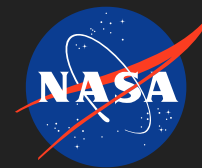


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Organizations Performing Work	Role	Type	Location
Mesa Photonics, LLC	Lead Organization	Industry	Santa Fe, New Mexico
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	New Mexico

Project Transitions

▶ **May 2013:** Project Start

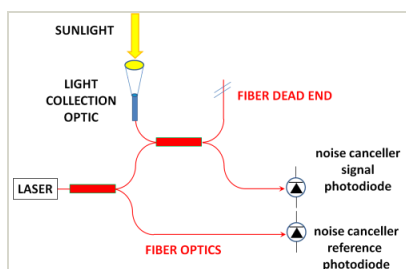
✓ **November 2013:** Closed out

Closeout Summary: Precision remote sensor for oxygen and carbon dioxide, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/140442>)

Images

**Briefing Chart Image**

Precision remote sensor for oxygen and carbon dioxide, Phase I
(<https://techport.nasa.gov/image/130709>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mesa Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

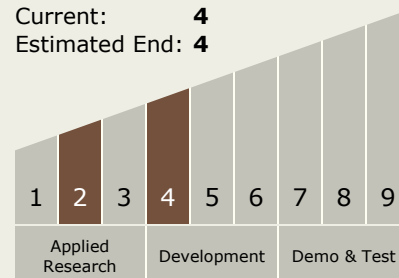
Carlos Torrez

Principal Investigator:

David Bomse

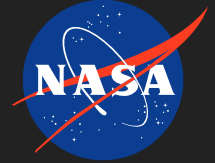
Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System